What is Claimed:

1. A process of joining an integrated circuit (IC) chip to a microelectronic circuit card comprising the steps of:

depositing a ball comprising lead (Pb) on solder wettable input/output (I/O) terminals of said IC chip such that said ball has an exposed surface;

depositing a layer of tin (Sn) having a thickness on the exposed surface of said ball;

providing a matching footprint of solder wettable I/O terminals on said microelectronic circuit card;

aligning said ball on said IC chip with the corresponding footprint on said microelectronic circuit card;

reflowing said layer of Sn to form a Pb/Sn eutectic alloy on said ball to bond said IC chip to said microelectronic circuit card; and

heating said Pb/Sn eutectic alloy for a predetermined time at a predetermined temperature to diffuse and intermix Sn from said Pb/Sn eutectic alloy and Pb from said ball.

2. The process of claim 1, wherein the thickness of said layer of Sn is less than 10.2 μm (0.4 mils).

3. The process of claim 1, wherein the predetermined temperature is 150°C and the predetermined time is in the range between 4 and 5 hours.

4. The process of claim 1, wherein the step of heating diffuses substantially all of the Sn in said Pb/Sn eutectic alloy into said ball to form an assembly having a weight composition of about 97/3 Pb/Sn.

5. The process of claim 1, wherein said solder wettable I/O terminals on said microelectronic circuit card are copper (Cu).

6. A process of joining an IC chip to a microelectronic circuit card comprising the steps of:

depositing a ball comprising Pb on solder wettable I/O terminals of said IC chip such that said ball has an exposed surface;

providing a matching footprint of solder wettable I/O terminals on said microelectronic circuit card;

depositing a layer of Sn having a thickness on said solder wettable I/O terminals on said microelectronic circuit card;

aligning said ball on said IC chip with said layer of Sn on said corresponding footprint on said microelectronic circuit card;

reflowing said layer of Sn to form a Pb/Sn eutectic alloy on said ball to bond said IC chip to said microelectronic circuit card; and

heating said Pb/Sn eutectic alloy for a predetermined time at a predetermined temperature to diffuse and intermix Sn from said Pb/Sn eutectic alloy and Pb from said ball.

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7. The process of claim 6, wherein the thickness of said layer of Sn is less than 10.2 μm (0.4 mils).

8. The process of claim 6, wherein the predetermined temperature is 150°C and the predetermined time is in the range between 4 and 5 hours.

9. The process of claim 6, wherein the step of heating diffuses substantially all of the Sn in said Pb/Sn eutectic alloy into said ball to form an assembly having a weight composition of about 97/3 Pb/Sn.

10. The process of claim 6, wherein said solder wettable I/O terminals on said microelectronic circuit card are Cu.

11. An interconnect structure for a semiconductor chip comprising:

a Pb-rich ball attached to said semiconductor chip and having an exposed surface; and

a thin layer of Sn deposited on said exposed surface of said Pb-rich ball;

wherein Sn from said thin layer and Pb from said ball are diffused and intermixed to form an assembly having a weight composition of about 97/3 Pb/Sn.

12. The interconnect structure of claim 11, wherein said thin layer of Sn has a thickness of less than 10.2 μm (0.4 mils).

13. An interconnect structure comprising a substrate, said substrate having at least one Pb-rich ball and at least a portion of said Pb-rich ball having at least one thin coating of a low melting point metal, wherein the melting point of said

low melting point metal is lower than the melting point of said Pb-rich ball, and said low melting point metal and Pb from said ball are diffused and intermixed to form an assembly having a relatively high melting point.

14. The interconnect structure of claim 13, wherein the thin coating of the low melting point metal has a thickness of less than 10.2 μm (0.4 mils).

15. A process of capping a Pb-rich ball with at least one layer of low melting point metal, said process comprising the steps of:

a) forming said Pb-rich ball on a substrate;

b) placing a mask over said Pb-rich ball such that a portion of said Pb-rich ball is exposed;

c) depositing at least one layer of a low melting point metal over said Pb-rich ball through said mask, such that at least a portion of said Pb-rich ball has a capping layer of said low melting point metal;

d) heating said Pb-rich ball and said capping layer of said low melting point metal to form a eutectic alloy having a Pb-rich core and a cap region of said low melting point metal;

e) annealing said eutectic alloy such that one of said low melting point metal from said cap region is diffused into said Pb-rich core and Pb from said Pb-rich core is diffused into low melting point metal from said cap region,

wherein the melting point of said low melting point metal is lower than the melting point of Pb.

16. The process of claim 15, wherein said low melting point metal is Sn.

17. The process of claim 16, wherein substantially all of the Sn is diffused into said Pb-rich core to form an assembly having a weight composition of about 97/3 Pb/Sn.

18. The process of claim 17, wherein the step of annealing is performed at 150°C for a time in the range between 4 and 5 hours.

19. The process of claim 15, wherein said capping layer of said low melting point metal has a thickness of less than 10.2 μm (0.4 mils).

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